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AN EFFICIENT EMULSION FOR COOLING TOOLS AND PARTS
 DURING THE MACHINE-TOOL MACHINING OPERATION IN THE USSR

Emulsions are used as cooling liquids in machining and often in grinding operations in USSR plants.

An emulsion of the required concentration is prepared by consumer plants from the "emulsol" of Neftesbyt (Petroleum Sales). The plants use an initial minimum concentration of the emulsion of 3-3.5 percent.

The emulsols of Neftesbyt consist of lathers of fatty naphthenic or resin acids and free acids. In 1946, the Moscow First State Bearing Plant converted to a new technology for the manufacture of emulsol using synthetic naphthenic acid (oxidized petrolatum), the saponification of which proceeds to the end, i.e., until the formation of neutral emulsol. The raw materials in the production of neutral emulsol are: (1) oxidized petrolatum with a saponification number of not less than 90; (2) any mineral oil with an Engler viscosity of from 2 to 4 at 50 degrees (waste oil, from which mechanical impurities and water have first been removed, may be used); (3) a 15-20 percent caustic soda solution.

Method of Preparing the Emulsol

Oxidized petrolatum is put into a container designed for the preparation of emulsol. The quantity of oxidized petrolatum per ton of neutral emulsol is compared with its saponification number in the following table:

Saponification Number of Petrolatum	Quantity of Oxidized Petrolatum (in kg)									
	0	1	2	3	4	5	6	7	8	9
90	365	352	348	344	341	337	333	330	326	323
100	320	317	314	311	308	305	302	300	296	293
110	291	288	286	283	281	278	276	273	271	268
120	266	264	262	260	258	256	254	252	250	248
130	246	244	242	241	239	237	236	234	231	230

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Saponification Number of Petrolatum	Quantity of Oxidized Petrolatum (in kg)									
	0	1	2	3	4	5	6	7	8	9
140	228	226	225	223	222	220	219	217	216	214
150	213	210	210	209	207	206	207	203	202	201
160	200	198	197	195	194	193	192	190	190	189
170	188	187	185	184	183	182	181	180	179	178
180	177	176	175	174	173	172	172	171	170	169

Mineral oil amounting to C kilograms per ton of emulsol is added to the oxidized petrolatum according to the formula $C = 1000 - b$ (b is the number of kilograms of oxidized petrolatum). After the mineral oil has been added, it is heated (electrical heating or dense steam), the temperature is raised to 50-60 degrees, and it is mixed until the petrolatum is completely dissolved in the oil. A vigorous mixing is continued, and for 3-4 hours a thin stream of caustic soda solution is run into the container to assure the 100 percent saponification of the synthetic acid (approximately 100-120 liters per ton) which has been added. After the addition of a computed quantity of caustic the mixing is continued for 2 hours at the same temperature. At the end of the 2-hour mixing period, a sample is taken out for analysis, according to which the preparation of the emulsol is undertaken. Emulsol, based on oxidized petrolatum does not emulsify in cold water; therefore, the production of emulsol should be carried out according to one of the two methods indicated below.

1. Immediately upon completion of the above preparation, the emulsol is converted into a 40-50 percent emulsion; this is done by putting the emulsol, still in a hot state, into a vat containing a corresponding amount of hot water (the temperature of the water should be not less than 60 degrees); the concentrated emulsion is obtained by vigorous mixing until a homogeneous mass results. The resulting concentrated emulsion is then mixed well in cold water in any proportion. By this ordinary method an emulsion of the necessary concentration is prepared.

2. The container designated for the preparation of the emulsion is filled to one fourth or one third of its capacity with hot water. The temperature of the water should be not less than 60 degrees. After vigorous mixing, emulsol, in a quantity sufficient to obtain the required concentration of emulsion, is put into the container. After careful mixing, an amount of water equal to approximately one half the capacity of the container is added and the solution is mixed another 10-15 minutes. After this, cold water is added until the container is completely full and the solution is again mixed. A sample is taken from the container for analysis. In the process of concentration of an emulsion of less than 4 percent, 0.3 percent soda and 0.15-0.25 percent sodium nitrite are added in order to obtain anticorrosive properties in the composition of the emulsion.

Remarks

1. The emulsion possesses good cooling, sanitary-hygienic, and anticorrosive qualities.
2. To the emulsion is added an inexpensive lather of synthetic naphthenic acid obtained from the wastes of petroleum production (instead of acidol and oleic acid).
3. The emulsion is prepared at a 50 percent lower concentration than it was formerly.

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The work of the Moscow First State Bearing Plant has shown the 1.5 percent emulsion to possess good working properties. This has resulted in a considerable saving for the plant.

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